Curriculum Guide

This guide can be used when developing course material to meet the competency requirements. It is not the intent of the association to be prescriptive in the material that course developers cover and the definitive material, when developing training programs, should ultimately be the competency profile.

10. Organization/Administration

11. Radiation Safety Program Administration

1. Administration/Responsibilities
    1. Executive
    2. Radiation Safety Committee
    3. Radiation Safety Professional
    4. Permit Holders/Authorized Users
    5. Department Management
    6. Radiation Users/Employees
2. Committees
    1. Radiation Safety Committee
    2. Workplace Safety Teams
    3. Annual and Quarterly Reports
3. Policy and Procedure Development
    1. Notification, Posting, Implementation
    2. Radiation Safety Office Organization and Responsibilities

12. Radiation Safety Act and Regulations

1. Canadian Acts and Regulations
    1. Provincial (Radiation Emitting Devices)
    2. Radiation Protection Bureau (Federal Radiation Emitting Devices)
    3. Canadian Nuclear Safety Commission
    4. Transport of Radioactive Material
    5. Occupational Health and Safety Act
2. Other Regulatory Agencies
    1. International Atomic Energy Agency (IAEA)
    2. International Commission on Radiation Protection (ICRP)
    3. Nuclear Regulatory Commission (NRC)
    4. National Council on Radiation Protection and Measurement (NCRP)
3. Canadian Nuclear Safety Commission General Policy and Guides

13. Licence/Permits

1. Types of Licences
    1. Nuclear Substance and Facility
2. Exemptions
    1. Exemption quantities of Nuclear Substances
3. Applications
    1. Licence application process

14. Working Rules

1. Area Posting and Signs
2. Security
3. Working Habits/Rules

1. General Safety

15. Record Keeping
1. Requirements
2. Forms
3. Disposal of records

20 Employee Qualifications/Performance

Categories of Worker-Public
1. Nuclear Energy Workers
2. Radiation Users (Authorized Users)
3. General Public
4. Pregnant Worker

Employee Training/Continuing Education
1. Program Development
    1. Competencies
    2. Knowledge Assessment
    3. Skills Identification
2. Program Outlines (appropriate for worker category)
3. Employee Training Requirements
4. Evaluation Methods

30. Inspections/Audits/Investigations

31. Inspections
1. Compliance Enforcement
    1. Minor Offence
    2. Major Offence

32 Audits
1. Elements of Radiation Safety Quality Control Program

33 Investigations
1. Reporting Incidents/Concerns
    1. Action Levels
2. Incident Response by Radiation Safety Professional
3. Trends

40 Exposure and Dose Control

Ionizing Radiation Theory
1. Types of Exposure
    1. Natural
    2. Medical
    3. Occupational
2. Types of Radiation
3. Radioactive Decay
    1. Types of decay
    2. Half-life
4. Interaction with Matter

Concepts of Risk
1. Radiation vs Lifestyle Risks
2. Risks vs Benefits

1. Diagnostic exposures
2. Therapeutic exposures
3. Occupational exposures

Units of Radiation Exposure and Dose

1. Exposure [Coulomb/Kg (C/Kg)]
2. Absorbed Dose [Gray (Gy)]
3. Dose Equivalent [Sievert (Sv)]
4. Activity [Bequerel (Bq)]

Radiation Exposure Limits

1. ALARA (As Low As Reasonably Achievable)
2. Dose Limits
    1. Nuclear Energy Worker vs General Public
    2. Effective Dose and Allowable Limits on Intake (ALI)
3. Area Surveys
    1. Storage, Rooms, General Areas

Practical Means of Radiation Protection

1. Time
2. Distance
    1. Inverse Square Law
3. Shielding
    1. Shielding Formula
    2. General Requirements for alpha, beta, x-ray, gamma, neutrons
    3. Half Value Layer
4. Protecting Patients/General Public (Minimizing Dose)

50 Instrumentation and Equipment

Radiation Monitoring Devices/Equipment

1. Types
    1. Contamination Monitors
    2. Survey Meters (Exposure)
2. Selection of Monitors for licence uses

Performance Checks/Calibrations

Radiation Protection Devices/Equipment

1. Personal Protection
2. Work Area

60 Radioactive Material Inventory Management

61. Purchasing/Inventory Tracking

1. Licence Conditions and Regulations
2. Purchasing Procedures
3. Inventory Tracking
    1. Routine (transfers)
    2. Loss or Theft

62. Receiving

1. Licence Conditions and Regulations
2. Receiving - Delivery
3. Opening Packages - Dangerous Occurrences

63. Transportation

1. Transport of Dangerous Goods Regulations

2. Packaging
3. Shipping

64. Storage

1. Requirements
    1. Short Term vs Long Term Waste
    2. Sealed Sources (routine and in devices)

65. Waste Disposal

1. General Responsibilities, Forms and Records
2. Categories of Waste
3. Environment Considerations
    1. Landfill, Sewer, Incineration
4. Disposal
    1. Limits and off-site options

70 Personnel Dosimetry

Radiation Exposure Hazards

1. External
    1. Common Sources
2. Internal
    1. Common Sources
    2. Methods of Entry

Factors Influencing Dose

1. Critical Organs vs Target Organs
2. Physical Properties
3. Biological Properties
4. Radionuclide Toxicity

Personal Monitoring

1. Licence Conditions and Regulations
2. Classification of Workers (see Section 20)
3. Monitoring Devices
    1. Type and Style of Personal Dosimeters
    2. Appropriate Wearing of Dosimeters
4. Monitoring Services
    1. Assigning Monitors
    2. Applying for Monitors
    3. Action Criteria
    4. Record Keeping

Bioassay (General Awareness)

1. Requirements and Frequency
2. Sampling Methods

External Exposure/Internal Dosimetry

1. Calculation of Absorbed Dose
2. Effective Dose Calculations
3. Contact Dose Rates

Radiation Biology (General Awareness)

1. Cell Structure and Function
2. Molecular and Subcellular Effects
3. Radiosensitivity
4. Biological Effects
    1. Somatic, Genetic, Deterministic, Stochastic
    2. Damage to Chromosomes

5. Medical Effects on Humans
    1. Acute vs Chronic
    2. Effects on Tissue
    3. Dose Limits
    4. Partial vs Whole Body Exposure
    5. Factors Influencing Effects

Pregnant Radiation Users

1. Licence Conditions and Regulations
2. Classification of Workers
3. Declaring Pregnancy
4. Dose Limits
5. Procedures and Forms

80 Contamination Control

Contamination Surveys

1. Contamination Monitoring
    1. Direct Monitoring (Contamination Meter)
    2. Indirect Monitoring (Wipe Test/Leak Test)
2. Personal Monitoring
3. Lost Sources

90 Emergency/Special Procedures

Emergency Procedures

1. Plan of action for different scenarios
2. Radiation Emergency Contact List
3. Response Equipment, Teams and Practice Scenarios

Specialty Area Curriculum Guide: To be developed as needed.

References:

1. Canadian Nuclear Safety Commission, *Radiation Safety in Educational, Medical and Research Institutions*, Regulatory Guide G-121, May 2000. (www.cnsc-ccsn.gc.ca/eng/licensees/current_docs.cfm)
2. United Kingdom Health and Safety Executive, *HSE Statement on Radiation Protection Advisers*, November 2001. (www.hse.gov.uk/hthdir/noframes/state.htm)
3. United States Nuclear Regulatory Commission, *Training for Radiation Safety Officer Section 35.50*, June 2002 Draft (www.nrc.gov/reading-rm/doc-collections/cfr/part035/part035-0050.html)
4. Tourneur, Frank, University Health Network (Toronto), *Report: Radiation Safety Training Needs Analysis for Radiation Safety Officers with Consolidated Licences*. April 2002.
5. Dalhousie University, *Bachelor of Health Science - Radiation Safety Officer Specialty Practice*, Fourth Year Component September 2002.
6. Capital Health (Nova Scotia), *Radiation Safety Officer Job Fact Sheet Analysis*, May 2002.
7. Canadian Association of Medical Radiation Technologists, *Technology Competency Profiles*.

Key Words for Competencies:

Assess • Adhere • Advise • Calculate • Calibrate • Check • Conduct • Demonstrate • Determine • Educate • Employ • Ensure • Explain • Evaluate • Follow • Identify • Implement • Initiate • Instruct • Investigate • Listen • Maintain • Manage • Monitor • Obtain • Operate • Perform • Plan • Prepare • Provide • Recognize • Recommend • Record • Respond • Select • Share • Use • Verify